



UNITED STATES ENVIRONMENTAL PROTECTION AGENCY  
REGION II

DATE: **OCT 27 2009**

SUBJECT: Removal Site Evaluation for the Raritan Bay Slag Site, Old Bridge Township and Borough of Sayreville, Middlesex County, New Jersey

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TO: File

I. INTRODUCTION

On April 24, 2008, the United States Environmental Protection Agency (EPA), Removal Action Branch received a request from the New Jersey Department of Environmental Protection (NJDEP) to evaluate the Laurence Harbor seawall for Comprehensive Environmental Response, Compensation and Liability Act (CERCLA) Removal Action consideration. On November 3, 2008 EPA received an amended request from the NJDEP to include the northern jetty (hereafter referred to as the western jetty) at the Cheesequake Creek inlet in the overall scope. The site was renamed as Raritan Bay Slag (Site). Based on a subsequent request from the NJDEP, an estimated 47-acre wetland area associated with Margaret's Creek was included in the Site.

There has been a release of CERCLA-designated hazardous substances at the Site. Slag deposits along the Raritan Bay shoreline contain elevated levels of lead, arsenic, antimony, copper, and to a lesser extent, other heavy metals. The soils, sediments, and surface water near the slag have been found to contain the same hazardous substances that are present in the slag. The Site, which is part of the Old Bridge Waterfront Park, is easily accessible to persons that use the area. Persons have been observed coming into direct contact with the slag and the surrounding impacted area. The Site is a popular location for persons to collect fish, crabs, and shellfish. Bait fish and shellfish caught near these slag deposits have been found to contain elevated levels of these same hazardous substances.

The New Jersey Department of Health and Senior Services (NJDHSS), under a cooperative grant with the Agency of Toxic Substances and Disease Registry (ATSDR), has concluded portions of the Site to be a Public Health Hazard.

Based on the available information, a CERCLA Removal Action is warranted at the Site to address the potential exposures to persons accessing certain areas and coming into contact with elevated levels of lead. A removal action was initiated on April 4, 2009 to limit access and post warning signs. The removal action was completed on September 3, 2009. This Removal Site Evaluation serves to further document the removal assessment. Additional human health and ecological risk evaluations are pending that may necessitate further response actions. The Site was proposed for placement on the National Priorities List on April 9, 2009.

## II. SITE CONDITIONS AND BACKGROUND

### A. Site Description

#### 1. Physical location

The Site is located north of Route 35 in the Laurence Harbor section of Old Bridge Township and in the Borough of Sayreville along the Raritan Bay in Middlesex County, New Jersey (see Figure 1). The Site consists of the Laurence Harbor seawall and the estimated 47 acres of wetland areas associated with Margaret's Creek, located in Old Bridge Township; and the western jetty extending from the Cheesequake Creek Inlet into Raritan Bay, located in the Borough of Sayreville (see Figure 2).

The Laurence Harbor seawall is adjacent to a portion of Old Bridge Waterfront Park. The park is made up of paved pathways, grassed areas, benches, a gazebo, a playground area, several public beaches connected by a boardwalk, and three jetties (not including the two jetties at the Cheesequake Creek Inlet). The park waterfront, approximately between the playground and the gazebo, is protected by a seawall partially constructed with pieces of slag. Slag was deposited along the beachfront in the late 1960s and early 1970s to form a seawall that spans approximately 2,500 feet.

The paved and grassed portion of the park is situated between Bayview Drive, the northernmost roadway within this portion of Laurence Harbor, and the seawall. A residential neighborhood lies between Bayview Drive and Route 35. Topographically, Bayview Drive is situated at a higher elevation than the park, which in turn blends into the seawall as it slopes towards Raritan Bay. The distance between Bayview Drive and the seawall is approximately 250 feet.

The park is a popular recreational area and serves as a link between the Laurence Harbor beaches and the Cliffwood Beach waterfront. A boardwalk that runs from the western end of Laurence Harbor, parallel to Shoreland Circle, ends just north of a parking area at the end of Laurence Harbor Parkway and then continues again briefly at the eastern end of the park as it crosses over Margaret's Creek. The beaches situated just west of the seawall and east of the eastern jetty of the Cheesequake Creek Inlet appear to be the most frequented for bathing due to their proximity to parking areas. There are three jetties with concrete pads in Laurence Harbor north of Shoreland Circle. Due to accessibility, the one closest to the seawall is the most popular for fishing. Persons have also been observed using the seawall and the area where Margaret's Creek flows into Raritan Bay to fish and catch other marine life, but to a lesser extent.

The western jetty at the Cheesequake Creek Inlet, and the adjoining waterfront area west of the jetty, contains slag as well. The jetty, which is approximately 800 feet in length and is situated near the Morgan Drawbridge, was covered with slag at approximately the same general time period as the seawall was in Laurence Harbor. It is situated on a relatively isolated piece of land bound by Raritan Bay to the north, the Cheesequake Creek inlet to the east, Route 35 to the south, and railroad line to the west. The jetty is part of a property that formerly housed the Robert E. Lee Restaurant in the 1980s. The closest residence to this portion of the Site is approximately 900 feet away on the opposite side of Route 35. The eastern jetty along the

Cheesequake Creek Inlet is located in Laurence Harbor. The Cheesequake Creek inlet is a popular location for fishing and crabbing. Persons use both of the jetties for these purposes, as well as the beach on the eastern side of the inlet, which is in Laurence Harbor. The deep channel inlet, which is 100 feet wide and generally five to six feet deep at its lowest point during Mean Low Water, serves as a passageway for boats kept in marinas on Cheesequake Creek, a predominantly recreational waterway used by small vessels. Cheesequake Creek is a tidal estuary that connects Raritan Bay to an inland marsh located generally between Route 9 and the bay.

Raritan Bay is a tidal water body that receives flow from the Raritan River and the Arthur Kill. Tides in the bay can vary by six feet at times. Due to the relatively shallow nature of the bay, a significant amount of tidal flats are exposed at low tides. Raritan Bay is considered a fishery and supports populations of striped bass, fluke, flounder, bluefish, tautog, and weakfish. The crustacean species include the blue claw crab, fiddler crab, green crab, and spider crab. A variety of clams, mussels, and oyster are also present in the bay. Horseshoe crabs, whose spawning habitats provide an important food source for migrating shorebirds, are present along the shorelines of Raritan Bay. Shorebird surveys have indicated the importance of Raritan Bay for spring and fall shorebird migration. Three species, sanderling, mddy turnstone and semipalmated sandpiper make up the majority of migratory shorebirds using Raritan Bay. Herons, osprey, egrets, and ibis have been documented to use the western portion of the bay for foraging.

Essential fish habitat (EFH) designations have been compiled and assigned by the National Oceanic and Atmospheric Administration's (NOAA) National Marine Fisheries Service for a variety of species in Raritan Bay. Fourteen species that have been identified in the Laurence Harbor area include: Atlantic butterflyfish, black sea bass, bluefish, cobia, Atlantic herring, king mackerel, Atlantic mackerel, red hake, scup, Spanish mackerel, summer flounder, windowpane, winter flounder, and dusky shark.

## 2. Site characteristics

Historical records indicate that in September 1972, the NJDEP was advised by a local environmental commission member that lead-bearing waste material was being disposed of along the Laurence Harbor beachfront. The material was reported to be non-recoverable, low-yield metallic waste from a blast furnace and blast furnace rubble. The slag was deposited at the beachfront in the late 1960s and early 1970s, mostly in the form of blast furnace pot bottoms, in an area that had sustained significant beach erosion and damage due to a series of storms in the 1960s. Demolition debris in the form of concrete and a variety of bricks, including fire bricks, was also placed along the beachfront. A portion of the seawall also contains large riprap believed to have been placed over the slag at the time the grassed and paved portion of the park was developed. It is reported that the slag extends to beneath the developed portion of the park.

The western jetty at the Cheesequake Creek has been in existence since the U.S. Army Corps of Engineers constructed it in the late nineteenth century. The slag was reportedly placed on the jetty during the same general time period as when the seawall was created. The entire jetty is covered with slag that is similar in appearance to that which is present on the seawall. Crushed

battery casings are evident on portions of the jetty, especially towards the southern end. Demolition debris in the form of concrete is also present, but to a lesser extent than at the seawall.

Most of the slag at the Site consists of various-sized, semi-spherical shaped objects. At the jetty, aside from the pot bottoms, there is also some evidence of an amorphous slag within which there is rock, crushed battery casings, and different forms of metal. In some locations on the jetty, especially closer to the southern end, the slag has been eroded and/or abraded into smaller pieces and finer dust. Evidence of pieces of the crushed battery casings is present, from east to west, along the first and second beach from the western end of the seawall, along the western edge of the westernmost beach in Laurence Harbor adjacent to the Cheesquake Creek Inlet, and to a lesser extent along the seawall. Most of the crushed battery casings are evident near or below the high tide marks on the beaches.

The Margaret's Creek Site, located between Laurence Harbor and Cliffwood Beach just southeast of the Site, is an area where the NJDEP had previously discovered lead-contaminated waste, including crushed battery casings. The NJDEP was the lead agency with respect to the investigation of the Margaret's Creek Site until recently, when it was referred to EPA for inclusion within the Raritan Bay Slag Site. It consists of an estimated 47-acre wetland area that is associated with the creek.

The Old Bridge Waterfront Park and the area around Margaret's Creek are owned by Old Bridge Township. The land adjacent to the western jetty at the Cheesquake Creek inlet has been vacant since a fire destroyed the restaurant that was there in the 1980s. The jetty and the adjoining waterfront area are privately owned. A portion of the waterfront west of the jetty is owned by the Borough of Sayreville.

### 3. Site assessment activities/observations

During the period of September 10 through September 16, 2008, the Removal Action Branch (RAB), with the assistance of the Region II Removal Support Team (RST) and Site Assessment Team (SAT) contractors, conducted sampling in support of an Integrated Assessment. This sampling event is presented under separate cover in "Summary Letter Report, Raritan Bay Slag Site" prepared for EPA by Weston Solutions, Inc., January 2009. A total of 105 surface soil samples, 84 sediment samples, and 48 surface water samples were collected from the Site and a nearby background location (see Figure 3).

The sampling for the Integrated Assessment included, from east to west, the collection of soil samples in the developed portion of the park near the seawall; along the seawall itself; from the beaches between the western edge of the seawall and the first jetty, the first jetty and the second jetty, and the third jetty and the eastern jetty of the Cheesquake Creek Inlet; from the waterfront area west of the western jetty at the Cheesquake Creek Inlet; and from the western jetty itself. Sediment and water samples were collected from Margaret's Creek; from Raritan Bay along the seawall and from the beaches between the western edge of the seawall and the first jetty, and between the third jetty and the eastern jetty of the Cheesquake Creek Inlet; from the waterfront area west of the western jetty of the Cheesquake Creek Inlet; and from the Cheesquake Creek

Inlet. Samples were collected from the slag at the seawall and the western jetty at the Cheesequake Creek Inlet. Background sediment samples were collected from the waterfront at the portion of Old Bridge Waterfront Park located in Cliffwood Beach, approximately 0.5 miles east of Margaret's Creek.

During the same period in September 2008, the EPA Environmental Response Team (ERT) collected biota samples (ribbed mussels, soft shell clams, hard shell clams, foraging fish, and sea lettuce) in the area of the seawall; sediment and pore water samples; and slag samples from both the seawall and the western jetty at the Cheesequake Creek Inlet (see Figure 4). This sampling event is presented under separate cover in "Raritan Bay Slag Site, Chemical Assessment Report, Characterization of Slag/Waste Material Fate, Transportation of Contaminants, Biomonitoring of Contaminants" prepared for EPA/ERT by Lockheed Martin/REAC, June 2009.

The analyses conducted for these samples, which varied for each media, included: Target Analyte List (TAL) metals (including tin) for soil, sediment, surface water and biota samples; dissolved and total TAL metals for surface water samples; Toxicity Characteristic Leaching Procedure (TCLP) metals and X-Ray Diffraction for certain surface soils and waste samples; and grain size distribution analysis for sediments.

During the period of April 20 through April 23, 2009, the Removal Action Branch, with the assistance of the Region II Removal Support Team (RST) and Site Assessment Team (SAT) contractors, conducted additional sampling to further investigate potential health threats to the public. This sampling event is presented under separate cover in "Summary Letter Report Phase II, Raritan Bay Slag Site" prepared by Weston Solutions, Inc. for EPA, June 2009. A total of 134 surface and near-surface soil samples, 116 sediment samples, and 34 surface water samples were collected from the Site and a nearby background location (see Figure 5).

The sampling for Phase II included, from east to west, the collection of soil, sediment, and water samples from the beach located between the Middlesex County Utility Authority (MCUA) wastewater pumping station and Margaret's Creek; between the first and second jetty; the second and third jetty; and the third jetty and the eastern jetty at the Cheesequake Creek Inlet. Background sediment samples were collected from the waterfront at the portion of Old Bridge Waterfront Park located in Cliffwood Beach, approximately 0.5 miles east of Margaret's Creek.

The analyses conducted for the second round of sampling included: Target Analyte List (TAL) metals for soil, sediment, and surface water samples. The surface water samples were also analyzed for dissolved TAL metals.

4. Release or threatened release into the environment of a hazardous substance, or pollutant or contaminant

The metal constituents primarily evident in the slag, as evidenced by the analysis of the material itself are: lead, arsenic, copper, antimony, and iron. Tin, zinc, silver, and nickel have been identified to a lesser extent.

The NJDEP collected 16 soil samples at the Margaret's Creek Site on March 14, 2007. The surface samples were biased to areas that contained shredded battery casings, slag, and other waste materials. Lead concentrations were found to range from 701 milligrams per kilogram (mg/kg) to 146,000 mg/kg, with an average concentration of 50,482 mg/kg.

The NJDEP collected surface soil samples over two rounds between May and July 2007. During the first round, elevated levels of lead, antimony, arsenic, and copper were detected in soils associated with the seawall. Amongst these samples, the maximum concentration detected were: lead (142,000 mg/kg), antimony (12,900 mg/kg), arsenic (3,350 mg/kg), and copper (3,590 mg/kg). The second round of surface soil samples was collected to investigate the park adjacent to the seawall where potential exposure to persons that use the walkway would most likely occur. Thirty-one samples were collected in the park, including a section of beach east of the foot bridge over Margaret's Creek. Two areas of potential concern were identified; one just south of the footbridge over Margaret's Creek and another on the beach between the western edge of the seawall and the first jetty. The former is actually within a portion of the seawall that wraps around the eastern edge of the park, west of Margaret's Creek. Elevated levels of lead (25,600 mg/kg) and other heavy metals were identified in this area that is isolated by a split-rail fence and contains exposed slag. The latter area consisted of two samples where lead was identified at 1,090 mg/kg (with a duplicate result of 647 mg/kg) and 545 mg/kg. The higher concentration was detected in an area of the beach directly adjacent to the western edge of the seawall.

The analytical results from the samples collected by EPA during the period of September 10 through September 16, 2008 indicated the presence of elevated levels of lead and other heavy metals in a variety of media. Four surface soil samples collected on the western jetty of the Cheesequake Creek Inlet ranged in lead concentration from 54,800 mg/kg to 198,000 mg/kg. These soil samples likely contained material from eroded slag since they were collected near slag that appeared to have been eroded and/or abraded. The maximum concentrations of antimony, arsenic, and copper detected on the western jetty were 3,120 mg/kg, 2,470 mg/kg, and 4,630 mg/kg, respectively. A soil sample collected west of the western jetty contained a lead concentration of 14,200 mg/kg. Sediment samples collected west of the western jetty contained lead concentrations as high as 2,150 mg/kg. Both sediment samples collected from the Cheesequake Inlet, close to the western jetty, which were identified to contain 42,200 mg/kg and 89,200 mg/kg of lead, were subsequently rejected as unusable during the data validation due to quality control issues pertaining to a low recovery on the matrix spike sample. The estimated maximum concentrations detected for antimony, arsenic, and copper at these two locations were 3,270 mg/kg, 2,100 mg/kg, and 2,050 mg/kg, respectively. The surface water west of the western jetty contained a maximum total lead concentration of 1,810 micrograms per liter ( $\mu\text{g/l}$ ). Antimony, arsenic, and copper were detected at maximum total lead concentrations of 53.2  $\mu\text{g/l}$ , 70.9  $\mu\text{g/l}$ , and 154  $\mu\text{g/l}$ , respectively, west of the western jetty. Surface water samples collected from the Cheesequake Creek Inlet contained a maximum total lead concentration of 6.7  $\mu\text{g/l}$ . The dissolved metals results for these samples, as well as those taken throughout the Site, were relatively similar to the total concentrations.

Surface soil samples collected from the beach area along the seawall contained estimated lead concentrations as high as 1,600 mg/kg. A surface soil sample collected from the portion of the seawall that wraps around the eastern end of the park near Margaret's Creek, south of the footbridge, contained an estimated lead concentration of 10,200 mg/kg. Sediment samples collected along the seawall contained a maximum concentration of 5,860 mg/kg. The maximum total lead concentration of surface water samples collected near the seawall was 153 µg/l. A surface water sample collected from a wetland area near the portion of the seawall that wraps around the eastern end of the park near Margaret's Creek contained a maximum total lead concentration of 298 µg/l. Water samples collected from Margaret's Creek near the seawall contained a maximum total lead concentration of 49.9 µg/l.

Nine of 13 soil samples collected in and around the seawall and the western jetty at the Cheesequake Creek Inlet exceeded the Resource Conservation and Recovery Act (RCRA) TCLP limit for lead (5 milligrams per liter (mg/l)). The TCLP results for the soil from the western jetty exceeded the limit by 100 to 250 times.

Elevated levels of lead were also identified at several surface locations on the beach between the western end of the seawall and the first jetty in Old Bridge Waterfront Park. The average lead concentration of the four highest detections at this location was 1,365 mg/kg, with a maximum lead concentration of 1,630 mg/kg. Subsurface samples collected from a location near the western edge of the seawall at depths of 6 to 12 inches and 12 to 18 inches were found to contain estimated lead concentrations of 18,400 mg/kg and 23,800 mg/kg, respectively. Sediment samples from this area indicated the presence of lead in concentrations ranging from 200 mg/kg to 533 mg/kg. Three activity-based water samples collected from the beach area situated between the western end of the seawall and the first jetty had an average total lead concentration of 1,179 µg/l, with a maximum lead concentration of 1,450 µg/l.

Surface soil samples collected from the beach area between the first and second jetty indicated the presence of estimated lead concentrations ranging from 109 mg/kg to 935 mg/kg. Surface soil samples collected from the beach area between the third jetty and the eastern jetty of the Cheesequake Creek Inlet indicated the presence of lead at concentrations ranging as high as 94.1 mg/kg. Sediment samples from this area contained a maximum lead concentration of 11.4 mg/kg. Surface soil samples collected from the beach area, parallel to the inlet on the eastern side of the Cheesequake Creek Inlet, contained a maximum lead concentration of 4.4 mg/kg. Activity-based surface water samples collected from the beach area contained a maximum total lead concentration of 99 µg/l.

Twenty-four surface soil samples collected from throughout the park and playground area contained a maximum estimated lead concentration of 97.8 mg/kg. Arsenic was detected at 144 mg/kg at one location at the playground.

The analytical results from the slag samples collected in September 2008 by ERT revealed elevated concentrations of arsenic, copper, lead, antimony, tin, and zinc. Lead concentrations exceeded 10,000 mg/kg for 15 of the 17 samples analyzed and 100,000 mg/kg for 5 of the 17 samples analyzed. The maximum concentrations detected for some of the other metals were: arsenic (15,200 mg/kg), copper (445,000 mg/kg), antimony (71,300 mg/kg), tin (11,400 mg/kg),

and zinc (13,400 mg/kg). Metal speciation analysis of the slag identified various lead, copper, arsenic, and tin compounds/species. With respect to lead, five different species were identified as being dominant in the slag. The interior and exterior layers of the slag contained different lead species, with the interior layers containing species with greater affinity to mobilize from the potential weathering and erosion of the slag. All 17 slag samples exceeded the RCRA regulatory limit for lead, designating the slag as hazardous waste. The highest TCLP result identified exceeded the limit by over 600 times. Particularly high levels of lead were determined to be leachable from neutral salt solutions with higher levels of leachable lead in the interior (non-weathered) samples compared with the exterior layer of the slag.

Soil and pore water collected along the intertidal zone adjacent to the seawall had high metal concentrations consistent with the release of metals from the slag. High concentrations of lead (2,400 ug/l), arsenic (230 ug/l), and antimony (270 ug/l) were measured in the unfiltered samples. In addition, high concentrations of dissolved lead (170 ug/l), arsenic (86 ug/l), and antimony (130 ug/l) were measured for several of the filtered samples.

The organisms collected from the intertidal zone included two mollusks (ribbed mussels and long neck or steamer clams), macroalgae, and foraging fish (killifish). In addition, hard shell clams were collected in the subtidal zone. The macroalgae had the highest metal accumulations for lead (80 mg/kg) and arsenic (15 mg/kg). Of the three mollusks, the juvenile clams accumulated the highest concentrations of lead (17 mg/kg) and copper (31 mg/kg).

The analytical results from the samples collected by EPA during April 2009 indicated the presence of elevated levels of lead at several surface locations (0 to 2 inches), albeit at levels lower than those found during the September 2008 sampling event. The highest concentrations detected in the soil, sediment and water were from the beach area between the first jetty and the second jetty. The maximum lead concentration detected in the soil was 771 mg/kg. The average lead concentration of the 14 grid-based soil sample locations from this area was 264 mg/kg. The highest lead concentration detected in the sediment samples was 1,090 mg/kg. The average concentration of the 14 sediment sample locations was 355 mg/kg. The highest lead concentration detected in the surface water samples was 767 ug/l and it was from an activity-based sample. All of the activity-based surface water samples throughout the Site contained higher concentrations of lead than the undisturbed surface water samples from the same area. The dissolved metals results for these samples, as well as those taken throughout the Site during the April 2009 event, were mostly all non-detect for lead.

Surface soil samples collected from 34 grid-based locations on the beach area between the second jetty and third jetty contained a maximum lead concentration of 199 mg/kg, with an average concentration of 37 mg/kg. Sediment samples collected from 22 locations in this area contained an estimated maximum lead concentration of 87.4 mg/kg, with an estimated average concentration of 37 mg/kg. The highest lead concentration detected in an activity-based surface water sample from this area was 519 ug/l.

Surface soil samples collected from 10 grid-based locations on the beach area between the third jetty and the eastern jetty at the Cheesquake Inlet contained an average lead concentration of less than 10 mg/kg. Sediment samples collected from 29 locations in this area also contained an



average concentration of less than 10 mg/kg. These sample locations spanned the central to eastern portion of this area where samples were not collected during the previous sample event in 2008. The highest lead concentration detected in an activity-based surface water sample from this area was 209 ug/l.

Surface soil samples collected from 36 grid-based locations on the beach area between the eastern side of Margaret's Creek and the MCUA pumping station contained an estimated average lead concentration of less than 5 mg/kg. Sediment samples collected from 36 locations in this area contained an average lead concentration of less than 10 mg/kg. The highest lead concentration detected in an activity-based surface water sample from this area was 37 ug/l. Six background sediment samples collected east of the MCUA pumping station contained an average estimated lead concentration of less than 5 mg/kg.

All of the materials listed above, except for tin, are CERCLA-designated hazardous substances, as listed in 40 CFR Table 302.4. The analytical data presented above is a summary of the most significant data available from the aforementioned reports. It is not meant to be inclusive of all of the analytes detected at the Site.

The mechanism for past releases to the environment appears to have been the placement of slag onto the waterfront along the Raritan Bay and the subsequent impact from the material being in direct contact with the water body. The slag has been present in a salt water environment for approximately 40 years resulting in deterioration of its surface. The release of the slag constituents into the marine environment is as a result of leaching and/or weathering caused by tidal fluctuations, wave action, and wind. These constituents are being biologically accumulated. The accumulation of contaminants in biota not residing immediately adjacent to the slag material reveal that the contaminants are being transported away from the source material.

The release into the Raritan Bay and the immediate surroundings of the Site will continue as long as the slag remains in its current state in this environment; providing an ever present loading of heavy metals at levels significantly above the background levels of an already impacted water body. The movement of the water in the bay will provide the main contaminant transport mechanism from the source, or from already contaminated areas, to adjoining areas within the bay. Persons using the areas in the vicinity of the slag could potentially be exposed to elevated levels of lead and other heavy metals.

## 5. NPL status

The Site was proposed for placement on the National Priorities List on April 9, 2009.

### B. Other Actions to Date

#### 1. Previous actions

A fund-lead CERCLA removal action was completed on September 3, 2009 resulting in the posting of signs and the limiting of access to the western jetty at the Cheesequake Creek Inlet, the seawall, and the beach to the west of the seawall.

A proposed cleanup by NL Industries in 2008 at the Margaret's Creek Site was reported to be deficient and rejected by the NJDEP.

2. Current action

There are currently no Federal or private CERCLA removal actions ongoing at the Site.

C. State and Local Authorities' Role

1. State and local actions to date

Based on the analytical results of the soil samples collected by the NJDEP at the Laurence Harbor seawall, the New Jersey Department of Health and Senior Services (NJDHSS) provided a health consultation. As a result of the health consultation, the Township of Old Bridge erected a temporary "snow" fence near the western edge of the seawall. Warning signs for people to stay off the seawall were posted along a split-rail fence that previously ran the entire length of the seawall (note: the split-rail fencing has been replaced by a chain-link fence). A letter was sent to all of the residents of Laurence Harbor informing them of the analytical results, the sign postings, and offering blood lead testing. The temporary fencing, while providing a visual demarcation, was not effective since persons walked around it, and access was available to the seawall, especially during low tide. The signs did not warn of the problem associated with the contamination at the seawall and the split-rail fence did not prevent people from accessing the area.

2. Potential for continued State/local response

At this time it is not known whether there will be any future State or local actions taken at the Site.

III. THREAT TO PUBLIC HEALTH OR WELFARE OR THE ENVIRONMENT, AND STATUTORY AND REGULATORY AUTHORITIES

A. Threats to Public Health or Welfare

**There is a potential exposure to nearby human populations or the food chain from hazardous substances, pollutants or contaminants (40 CFR §300.415(b)(2)(i)).** Persons, including children, are coming into direct contact with the slag and the area around the slag that has been impacted by the release of hazardous substances. The slag has deteriorated over time resulting in a release of elevated levels of hazardous substances onto the adjoining beach and tidal flats of the Raritan Bay. Limited security measures previously taken at the Laurence Harbor seawall have not prevented access to the impacted area. Persons have been observed fishing from both the seawall and the western jetty at the Cheesequake Inlet, collecting clams and mussels near the seawall, and catching crabs in and around the Cheesequake Creek Inlet. Persons have also been observed eating while present at both of the slag areas, increasing the potential for ingestion of the hazardous substances. Based on the analytical results of samples

collected from clams, mussels, and small fish in the area of the Site, elevated levels of hazardous substances have been detected in the food chain. These substances could potentially impact larger fish that use the bay and have the potential to be consumed by persons fishing in the area of the Site. Discussions with persons fishing in the area have revealed that there are persons that consume their catch, including fish, crabs, and soft shell clams.

In 2007, samples collected by the NJDEP from the adjoining beach and the park were evaluated by the NJDHSS. It was concluded, based on an elevated detection of lead on the edge of the beach near the western end of the seawall, that children (aged 6 to 84 months) who visit the beach more than three days per week over a three month period would be at risk of having elevated blood levels higher than the recommended protection level. Based on these findings, it was recommended that access to this area be restricted via use of temporary fencing, while additional delineation of contamination was planned, and warning signs be posted along the seawall to prevent access to this area.

The NJDHSS, under a cooperative grant with ATSDR, evaluated the analytical data generated by EPA during the September 2008 sampling event. It was concluded, as documented in "Evaluation of Environmental Data, Raritan Bay Slag" prepared by NJDHSS, February 2009, that the seawall and the beach between the western edge of the seawall and the first jetty represent a Public Health Hazard based on lead exposures to children. The western jetty at the Cheesequake Creek Inlet represents a Public Health Hazard based on potential health effects associated with elevated levels of lead, antimony, and arsenic.

High levels of hazardous substances or pollutants or contaminants in soils, largely at or near the surface, may migrate (**40 CFR §300.415(b)(2)(iv)**). Elevated levels of lead, antimony, arsenic, and copper have been identified in slag that is present on the banks of the Raritan Bay. The slag and the impacted soils and sediment are present in a marine environment that is subject to changing tides and weather conditions. At high tide, a significant portion of the slag is submerged. In the area of the western jetty at the Cheesequake Creek Inlet, some of the slag remains submerged even during low tide periods. As a result of contaminant migration, the soil and sediment in around the slag, and even beyond the immediate area of the slag, has been contaminated by these heavy metals. This contamination is susceptible to migration into other parts of the Raritan Bay and potentially could continue to increase the overall loading of these heavy metals beyond the immediate area of the slag. The slag deposits and the areas around them are frequented by persons for fishing, crabbing, clamming, and other recreational uses and are easily accessible.

Weather conditions exist that may cause hazardous substances to migrate or be released (**40 CFR §300.415(b)(2)(v)**). The slag deposits are exposed to nature and, under normal conditions, are impacted by being in contact with salt water and wind. The slag is further susceptible to ongoing erosion, scouring, and leaching from exposure to heavy winds, tidal action, salt water, and abrasive sand and gravel. These weather conditions increase the potential for a physical release of particles and/or a chemical leaching of the slag. A heavy surf, caused by strong winds, can stir up the sand and gravel and erode the slag. It can also provide a transport mechanism for the existing contaminated sediments to become entrained into the water column and migrate further from the seawall and the jetty.

B. Threats to the Environment

There is an actual or potential exposure to nearby animals or the food chain from hazardous substances, pollutants or contaminants (40 CFR §300.415(b)(2)(i)). The Raritan Bay is considered a fishery. Striped bass, fluke, flounder, bluefish, tautog, and weakfish are present in the bay. Blue claw crabs, fiddler crabs, green crabs, spider crabs, clams, mussels, and oyster are also present in the bay, some of which are trapped and/or extricated in and around the Site. An EFH designation has been assigned by NOAA for a variety of species in Raritan Bay. CERCLA hazardous substances have been identified as having migrated from the Site. These hazardous substances have also been detected in samples collected of clams, mussels, and foraging fish. These substances could potentially impact larger fish and birds that use the bay. Numerous birds can be seen flying and eating near the shoreline at the Site. These birds would be expected to be consuming small fish, clams, worms and other species that can be found in the immediate shoreline adjacent to the slag deposits.

High levels of hazardous substances or pollutants or contaminants in soils, largely at or near the surface, may migrate (40 CFR §300.415(b)(2)(iv)). Elevated levels of heavy metals have been identified along the shoreline of the Raritan Bay at the Site and in its sediments. The location of this contamination in a tidal, salt water setting makes it susceptible for further migration. Most of the seawall and the western jetty are submerged during normal high tides. These potential releases could impact the fish and wildlife in the area of the Site.

Weather conditions that may cause hazardous substances or pollutants or contaminants to migrate or be released (40 CFR §300.415(b)(2)(v)). Rainfall and flood events increase the likelihood that the heavy metals will migrate from the slag into the Raritan Bay. During periods of elevated flow and windy weather, the turbulence of the waters in the bay increase and further scour the slag and the immediate shoreline potentially introducing an increased amount of contaminants into the water column. This release could potentially impact the fish and wildlife in the area of the Site.

There are no other appropriate federal or state response mechanisms available to respond to the situation (40 CFR §300.415(b)(2)(vii)). The NJDEP has requested that EPA abate the threats posed by the Site.

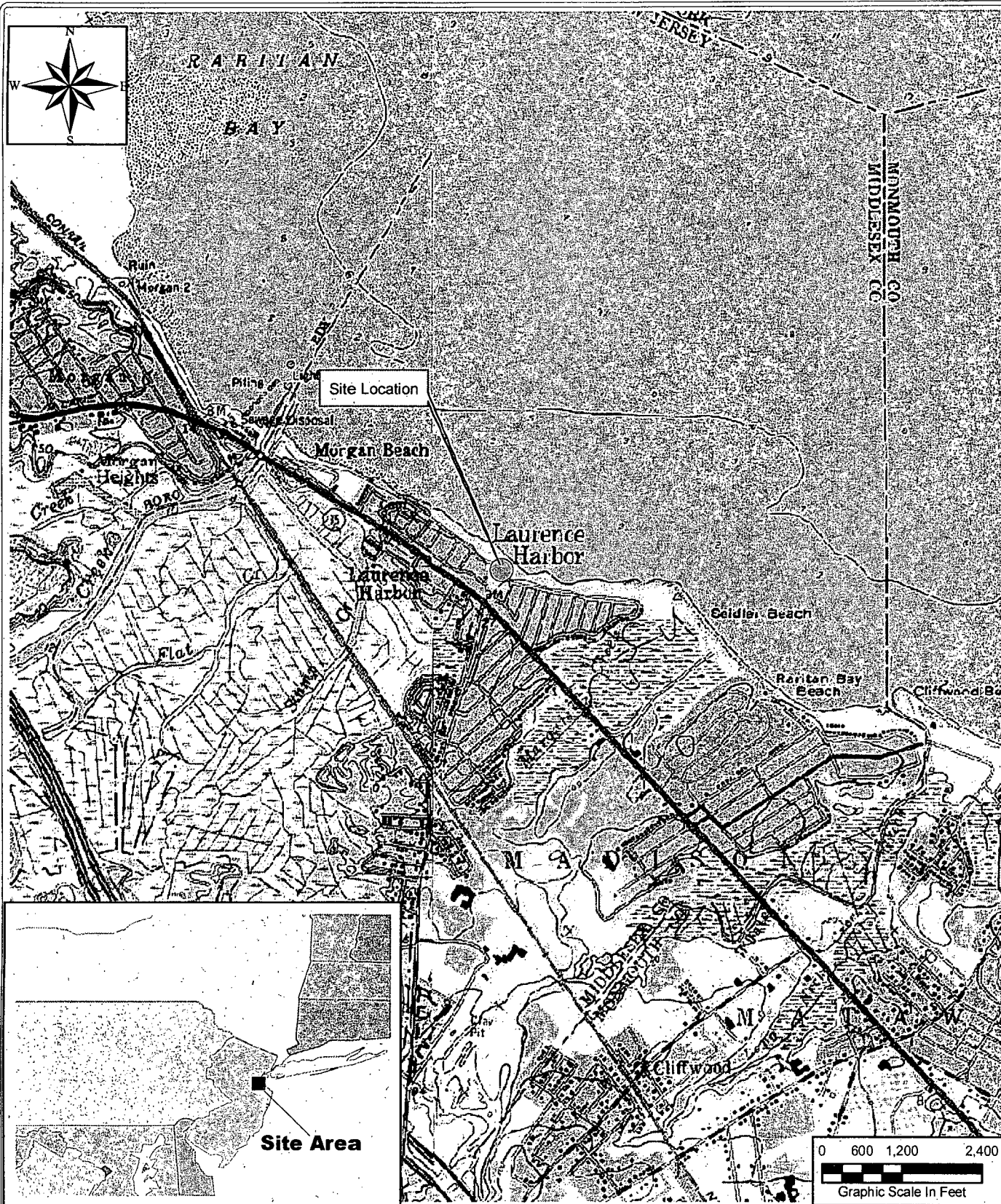
IV. EXPECTED CHANGE IN THE SITUATION SHOULD ACTION BE DELAYED OR NOT TAKEN

Delayed action will increase public health risk to those persons that access the Site. In addition, the potential exists for continued release of elevated levels of CERCLA hazardous substances into Raritan Bay.

## V. CONCLUSIONS

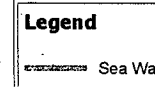
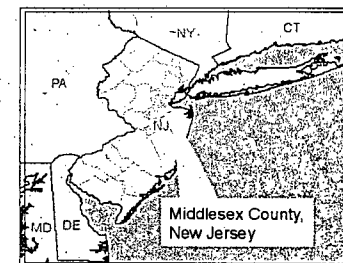
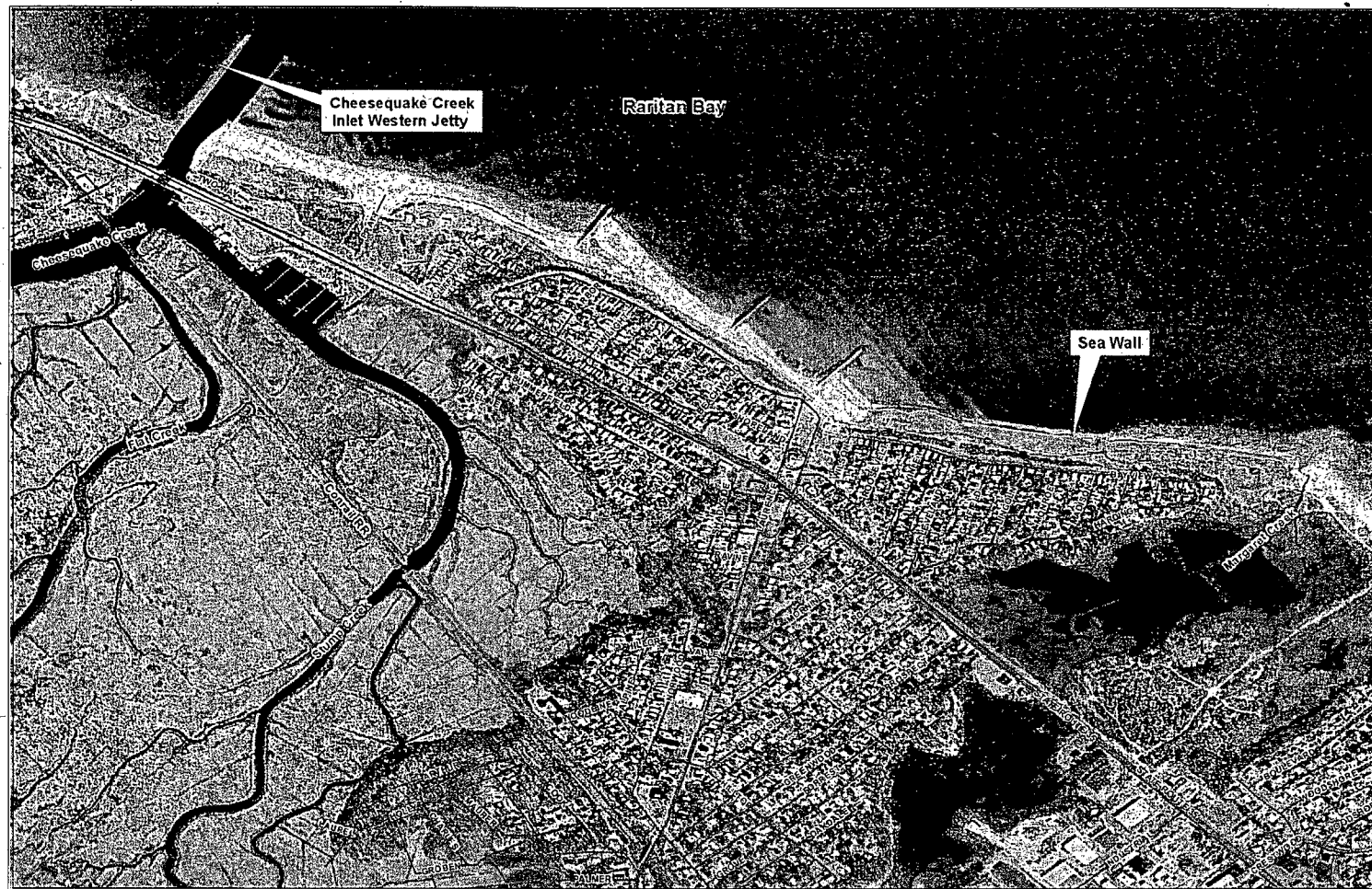
Based on the available information, a release of CERCLA hazardous substances, as defined in Section 101(22) of CERCLA, 42 U.S.C. Section § 9601(22), has occurred at the Site. The Site is a facility as defined under Section 101(9) of CERCLA, 42 U.S.C. § 9601(9). A removal action was previously recommended, under verbal authorization from the Division Director of the Emergency and Remedial Response Division, based on the results of the sampling event in September 2008 and the subsequent NJDHSS evaluation. The action was initiated on April 4, 2009 to post warning signs and restrict persons from accessing the seawall, the beach between the western edge of the seawall and the first jetty, and the western jetty at the Cheesequake Creek Inlet. The removal action was completed on September 3, 2009. This Removal Site Evaluation serves to further document the removal assessment.

Additional sampling has taken place within Raritan Bay to further delineate the area that has been impacted by the Site. Additional human health and ecological risk evaluations are pending that may necessitate further response actions.



<b>LEGEND:</b> Site Location National Geographic TOPO! U.S. Geologic Survey (USGS). 7.5 Minute Series (Topographic) Quadrangles: Keyport, NJ, 1977 and South Amboy, NJ, 1995.		<b>TITLE:</b> <h2 style="text-align: center;">Site Location Map</h2> <h3 style="text-align: center;">Raritan Bay Slag</h3> <h3 style="text-align: center;">Laurence Harbor, NJ</h3>	
<b>PROJECT:</b> Raritan Bay Slag		<b>DATE:</b> August 2008	
<b>CLIENT NAME:</b> EPA		<b>FIGURE #:</b> 1	





Map created using New Jersey 2007 color orthorectified photography.

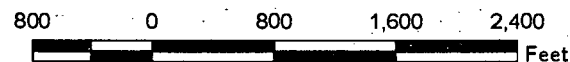
Map Creation Date: 18 May 2009

Coordinate system: New Jersey State Plane

GPS: 2000

Datum: NAD83

Units: Feet



Data: g:\env\projects\100-356  
 VAO file: g:\env\projects\100-356\vaos\100-356\_StateOverview.jfile002  
 Revision Number: 002

U.S. EPA Environmental Response Team  
 Response Engineering and Analytical Contract  
 EP-C-04-032  
 W.A.# 0-356

**Figure 1**  
 Site Overview  
 Raritan Bay Slag Site  
 Old Bridge Township, New Jersey  
 May, 2009





- Legend**
- Soil Sample Location
  - Sediment Sample Location
  - Surface Water Sample Location



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REPORT DATE  
 September 2008

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PROJECT NUMBER  
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CONTRACT NO.  
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EXAMINED BY  
 J. Lynes  
 DATE CREATED  
 09/22/2008

CLIENT NAME

EPA

PROJECT NAME

Raritan Bay Slag Site

DRAWING TITLE

Raritan Bay Slag Site  
 Sample Location Map

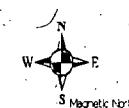
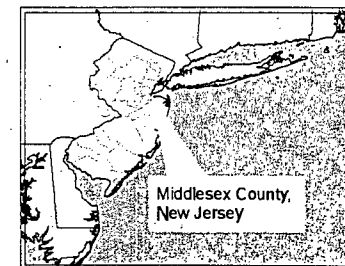
FIGURE  
 3

SCALE  
 1" = 250'

DATE  
 09/22/2008

SOURCE: 2002 High Resolution Orthophotography, State of New Jersey  
 Department of Transportation, Office of Geographic Information Systems  
 Project 3-0001, Appendix C, Raritan Bay Slag Site  
 AIRDATE: 09/04, 09/05, 09/06, and 09/07/05. Revision: 0  
 September 10, 2008





- Legend**
- Sampling Locations**
- MYA 1 to 5
  - RM 1 to 6
  - ULVA 1 to 5
  - Mercenaria 1 to 3
  - Killifish 1 to 5

Map created using New Jersey 2007 color orthophotography, site GTS survey data.

Map Creation Date: 18 May 2009

Coordinate system: New Jersey State Plane  
 FIPS: 2900  
 Datum: NAD83  
 Units: Feet

100 0 100 200 300 400  
 Feet

Data: g:\arcview\projects\res400-356  
 MID file: g:\arcview\projects\res400-356\source\station356\_Site\_Survey\_Data\_Map\_12rev002  
 Revision Number: 032

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 Response Engineering and Analytical Contract  
 EP-C-04-032  
 W.A.# 0-356

**Figure 4**  
 Sampling Locations  
 Raritan Bay Slag Site  
 Old Bridge Township, New Jersey  
 May, 2009



SOURCE:  
 2005 Topographic Data of New Jersey  
 Office of Information Technology, Office of Geographic Information Systems  
 Digitized by: J. Lynes  
 WESTON SOLUTIONS, INC. Project 2005-01-01  
 4/24/2009

**Legend**

- Soil Sample Location
- Surface Water Sample Location
- Sediment Sample Location



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 DRAFTER/DESIGNER BY  
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 DATE CREATED  
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CLIENT NAME  
 EPA  
 PROJECT NAME  
 Raritan Bay Slag Site

DRAWING TITLE  
 Raritan Bay Slag Site  
 April 2009 Sample Location Map  
 FIGURE  
 5  
 SCALE  
 1" = 250'  
 DATE  
 04/30/2009